SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior steel-stud walls.
2. Exterior sheathing and air-infiltration barriers.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 9 Section "Gypsum Board Assemblies" for gypsum board and nonload-bearing metal-stud framing and ceiling-suspension assemblies.
3. Division 9 Section "Gypsum Sheathing" for gypsum sheathing applied to exterior steel framing.

1.3 PERFORMANCE REQUIREMENTS

A. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following:

1. Center for Cold-Formed Steel Structures (CCFSS) Technical Bulletin, Vol. 2, No. 1, February 1993 "AISI Specification Provisions for Screw Connections."

B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with physical and structural properties as indicated.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of cold-formed metal framing, accessory, and

product specified.

C. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.

1. In lieu of mill certificates, submit test reports from a qualified independent testing agency evidencing compliance with requirements.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing:

1. Expansion anchors.
2. Powder-actuated anchors.
3. Mechanical fasteners.

G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence cold-formed metal framing's compliance with building code in effect for Project.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are

indicated, provide cold-formed metal framing identical to that tested as part of an assembly for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated in the Work include, but are not limited to, the following:

1. American Studco, Inc.
2. Angeles Metal Systems.
3. California Metal Systems, Inc.
4. Consolidated Fabricators Corp.
5. Design Shapes in Steel.
6. Knorr Steel Framing Systems.
7. Scafco Corporation.
8. United Construction Supply.
9. United States Steel.
10. Western Metal Lath Co.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653 (ASTM A 653M), zinc coated according to ASTM A 525 (ASTM A 525M), and as follows:

1. Coating Designation: G 60 (Z 180).
2. Grade: Grade A, 33,000 psi (230 MPa) minimum yield strength, 20 percent elongation. (18 ga and lighter)

3. Grade: Grade D, 50,000 psi (345 MPa) minimum yield strength, 12 percent elongation. (12, 14, and 16 ga)

2.3 WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges:

1. Web: Punched.

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturers standard deep flange where indicated, standard flange elsewhere.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36 (ASTM A 36M), zinc coated by the hot-dip process according to ASTM A 123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel bolts; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.

C. Expansion Anchors: One piece, wedge-style assembly of indicated sizes of zinc-plated steel.

1. Follow manufacturer's instructions for installation.

2. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

    a. Kwik-Bolt II; Hilti, Inc., Tulsa, OK.
    b. Power-Stud; Powers Fastening, Inc., New Rochelle, NY.
    c. Trubolt Wedge; ITW Ramset / Red Head, Wood Dale, IL.

D. Adhesive (Epoxy) Anchors for Concrete or Grouted Masonry: ASTM A36 corrosion-resistant steel threaded rods of indicated diameters and embedded lengths. Chamfer rod ends. Nuts and washers to match rods. Injectable two-component epoxy adhesive, or proprietary resin/hardener adhesive, in side-by-side cartridges. Inject through static mixing nozzle.

1. Follow manufacturer's instructions for installation.
2. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

    a. HIT HY150 System; Hilti, Inc., Tulsa, OK.
    b. Power-Fast System; Powers Fastening, Inc., New Rochelle, NY.
    c. Epcon System; ITW Ramset / Red Head, Wood Dale, IL.

E. Adhesive (Epoxy Screen Tube) Anchors for Hollow Masonry: ASTM A36 corrosion-resistant steel threaded rods of indicated diameters and embedded lengths. Chamfer rod ends. Nuts and washers to match rods. Low carbon, zinc-plated wire mesh screen tubes. Injectable two-component epoxy adhesive, or proprietary resin/hardener adhesive, in side-by-side cartridges. Inject through static mixing nozzle.

1. Follow manufacturer's instructions for installation.
2. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

    a. HIT HY20 System; Hilti, Inc., Tulsa, OK.
    b. Power-Fast System; Powers Fastening, Inc., New Rochelle, NY.
    c. Epcon System; ITW Ramset / Red Head, Wood Dale, IL.

F. Powder-Actuated Anchors: Low velocity powder-driven pins at indicated spacings for anchoring track material to concrete or steel services. 0.14 inch minimum diameter. 1 inch minimum embedded length into concrete.

1. Minimum working load in shear in concrete: 180#.
2. Minimum working load in shear in 1/8 inch thick steel: 400#.

G. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard

elsewhere.

H. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.7 GYPSUM SHEATHING

A. Sheathing: Comply with requirements of Division 7 Section "Exterior Insulation and Finish Systems--Class PB."

B. Sheathing: Comply with requirements of Division 9 Section "Gypsum Sheathing."

C. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material surfaced on face, back, and long edges with water-repellent paper bonded to the core. Comply with ASTM C 79 and requirements indicated below:

1. Type: Regular.
2. Edge and End Configuration: Square.
3. Thickness: 1/2 inch (12.7 mm).
4. Thickness: 5/8 inch (16 mm).

D. Available Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the Work include, but are not limited to, the following:

1. Gypsum Sheathing Board with Water-Resistant Core, Regular Type:

a. Gyproc Gypsum Sheathing; Domtar Gypsum Co.
b. G-P Gypsum Sheathing; Georgia-Pacific Corp.
c. Gold Bond Jumbo Gypsum Sheathing; National Gypsum Co., Gold Bond Building Products Div.
d. Gold Bond Regular Gypsum Sheathing; National Gypsum Co., Gold Bond Building Products Div.
e. USG Gypsum Sheathing; United States Gypsum Co.

E. Sheathing Fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a

minimum of 1-1/4 inches (32 mm) long, with organic-polymer coating or other corrosion-protective coating.

2.8 TAPES AND SEALANT

A. Sheathing Tape: Tape specifically designed and manufactured to seal joints in gypsum sheathing against water and air infiltration, formulated with an adhesive that permanently bonds to gypsum sheathing substrates, and as indicated below:

1. Linerless, polypropylene sheathing tape, 0.0027 inch (0.07 mm) thick, 2-1/2 inches (63 mm) wide, composed of oriented polypropylene backing coated with permanent acrylic adhesive formulated to adhere to gypsum sheathing surfaces.
2. Polyethylene tape, 0.025 inch (0.63 mm) thick, 3 inches (76 mm) wide, composed of polyethylene backing coated with synthetic-rubber-based adhesive.
3. Self-adhering, glass-fiber tape, 2 inches (51 mm) wide, 10-by-10 or 10-by-20 threads per inch (25.4 mm), of type recommended by tape manufacturer to use with siliconized emulsion sealant in sealing joints and fasteners for gypsum sheathing, and with a history of successful in-service use.
4. Available Products: Subject to compliance with requirements, sheathing tapes that may be incorporated in the Work include, but are not limited to, the following:

a. No. 8086 Contractor Sheathing Tape; 3M Construction Markets.
b. Perma-Tite Tape--PGM 207A; PermaGlass-Mesh, Inc.
c. POLYKEN 612 Seam Seal Tape; Polyken Technologies.
d. Quik-Tape; Quik-Tape, Inc.

B. Silicone Emulsion Sealant: Product complying with ASTM C 834, compatible with sealant tape and gypsum sheathing, recommended by manufacturers of both sheathing and tape for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Product: Subject to compliance with requirements, provide Elmer's Siliconized Acrylic Latex Caulk; Borden, Inc.

2.9 AIR-INFILTRATION BARRIER

A. Provide one of the following products:

B. Provide the following product:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I, No. 15 asphalt felt, unperforated.
2. Polyethylene sheet, 0.0061 inch (0.15 mm) thick, formed by spinning

continuous strands of fine, high-density polyethylene interconnected fibers and bonding them together by heat and pressure; incorporating an additive to provide ultralight resistance for up to 120 days; with a water-vapor transmission rate equaling 669 g in 24 hours through 1 sq. m of surface per ASTM E 96 procedure B and flame-spread and smoke-developed ratings of 0 and 25, respectively, per ASTM E 84.

3. Laminated polyethylene sheet, 0.003 inch (0.08 mm) thick, consisting of 2 plies of microperforated, cross-laminated polyethylene sheets, with a water-vapor transmission rate equaling 87.2 perms (5000 SI perms).
4. Polypropylene sheet, 0.0095 inch (0.24 mm) thick, consisting of spun-bonded polypropylene substrate with a polypropylene coating attached directly to 1 side; with a water-vapor transmission rate equaling 117 g in 24 hours through 1 sq. m of surface per ASTM E 96 procedure B and flame-spread and smoke-developed ratings of 0 and 15, respectively, per ASTM E 84.
5. Woven polyolefin sheet, 0.005 inch (0.13 mm) thick, with a water-vapor transmission rate equaling 65 g in 24 hours through 1 sq. m of surface per ASTM E 96 procedure A and a flame-spread rating not exceeding 25 per ASTM E 84.

C. Available Products: Subject to compliance with requirements, air-infiltration barriers that may be incorporated in the Work include, but are not limited to, the following:

1. Tyvek Housewrap; DuPont Company, Fibers Department.
2. Rufco-Wrap; Raven Industries, Inc.
3. Typar HouseWrap; Reemay, Inc.
4. Barricade Building Wrap; Simplex Products.

2.10 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Fabricate framing assemblies in jig templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting,

or screw fastening, according to manufacturer's recommendations.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.

C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

C. Install framing members in one-piece lengths, unless splice connections are

indicated for track or tension members.

D. Provide temporary bracing and leave in place until framing is permanently stabilized.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.

G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum sheathing board according to manufacturer's instructions and GA-253 "Application of Gypsum Sheathing."

B. Install square end and edged sheathing vertically with long edges parallel to, and centered over, studs. Install solid blocking where end joints do not bear against framing sills or track. Fasten gypsum sheathing board to perimeter framing and to each stud with self-drilling, bugle-head screws, located a minimum of 3/8 inch (9.5 mm) from ends and edges of board units, as follows:

1. Space fasteners not more than 8 inches (203 mm) apart around perimeter at edge and end supports and 8 inches (203 mm) apart at intermediate supports.

3.4 TAPE AND SEALANT APPLICATION

A. Sheathing Tape: Apply sheathing tape to joints in sheathing; overlap tape by not less than the tape width at joint intersections.

1. For polyethylene tape, apply primer, specified by tape manufacturer, to sheathing surfaces. In addition, apply polyethylene tape, 2 inches (50 mm) square, to completely cover each exposed fastener.
2. For glass-fiber tape, apply approximately a 3/8-inch (9.5-mm) bead of siliconized emulsion sealant to tapes along joints and embed sealant into tapes along their entire surface with a trowel. In addition, apply sealant

with a trowel to each exposed fastener so that fasteners are completely covered.

3.5 AIR-INFILTRATION BARRIER INSTALLATION

A. Cover sheathing with air-infiltration barrier as follows:

1. Apply asphalt-saturated organic felt horizontally with 2-inch (51-mm) overlap and 6-inch (152-mm) endlap; fasten to sheathing with corrosion-resistant staples.
2. Apply plastic sheet according to manufacturer's printed recommendations with a 4-inch (102-mm) overlap.
3. Apply woven polyolefin sheet according to manufacturer's printed recommendations with a 4-inch (102-mm) overlap.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing agency employed and paid by Contractor will perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Protect gypsum sheathing that will be exposed to weather for more than one month as follows:

1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at the time sheathing is applied.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer to ensure that cold-formed metal framing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05400